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→ Commonse Electronics

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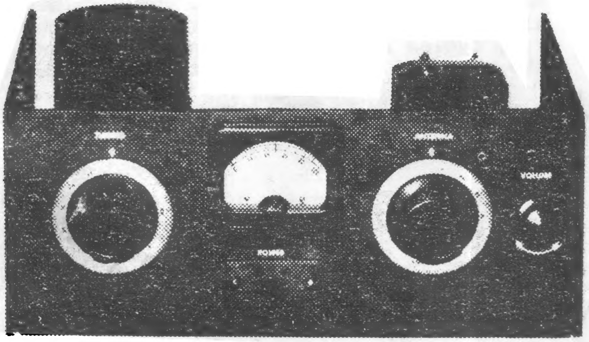

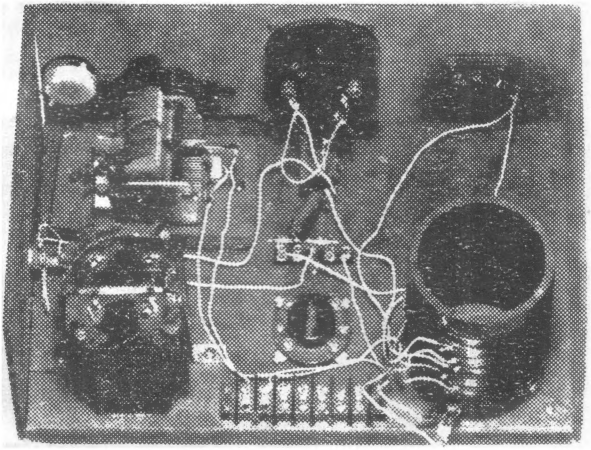

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NEXT MONTH: (late, as usual!)

Apologies apologies for not including Burlinson's Light Beam Electronics as promised (see p.53). It starts in August. Together with A New Look at Old I.F. Amps, More (discrete!) Counting Circuits, and more on the Parts Crisis, etc etc.

STOP PRESS! 4th Ed. G3VA's A.R. Techniques, " $3.30 that magnificent book (EEB Feb 71), now £1.60 +post. Order from W.I.A. or RSGB!

THE RECIPROCATING DETECTOR -- a new development in communications technology

-- by R. S. Badessa (of Damon Corporation, /W1)

-- Part I: The Basic System*

The Surprising Detector

The Reciprocating Detector (RD) was originally intended for demodulation of carrierless double sideband transmissions (DSSC). The first one, built several years ago, used only two transistors, so it was quite inexpensive. It was also an oddity, since it required no source of power other than the i.f. signal itself.

I put it in a closed box with the input labelled r.f. and the output labelled audio and found, surprisingly, that this "passive" detector of DSSC could detect SSB as well. But there were other surprises.

When I tuned the receiver to a selectively fading AM signal, the detected output maintained its intelligibility while the receiver's own AM detector garbled in the well-known manner. The reason for this, I surmised, was that the RD did not depend on the carrier nor upon the existence of the two sidebands simultaneously. Such portions of the carrier or the sidebands as existed, it made use of, but it could continue to to function even if only one sideband remained.

Another surprise was its performance against impulse interference. On AM the rejection of impulses was impressive. On SSB it was noticeable, but not as effective, which is one reason for the more sophisticated later design. (The sophistication included the introduction of d.c. power so that the device lost its mysterious passive character, but gained in dynamic range of input signal and in overall reliability.)

The Synchronous Reference

Before getting into circuit details, lets look at how the RD generates a synchronous reference for demodulation of DSSC through the use of regenerative feedback.

Waveform (A) of fig. 1 is an AM signal with sinusoidal modulation. Removing the carrier results in the DSSC signal at (B). Notice that the envelope of (B) is a full-wave rectified version of the original modulation, and that to recover the original from (B) we must "unrectify" the envelope using as a guide the phase information which the r.f. under it contains. For the example shown, the r.f. has the same phase as the original carrier during the positive part of the modulation cycle, and is 180° out of phase with it during the negative part.

As a first step in demodulation, the RD halfwave rectifies waveform (B) to produce the waveform shown at (C). This does not remove the r.f. component, nor the phase information associated with it. It has, of course, introduced an audio component, but not a useable one. It has also clipped off the negative half of the r.f. cycles so when I say "phase" I mean the phase of the fundamental.

Waveform (D) shows the result of "unrectification", i.e., the flipping-over of all portions of the waveform having an

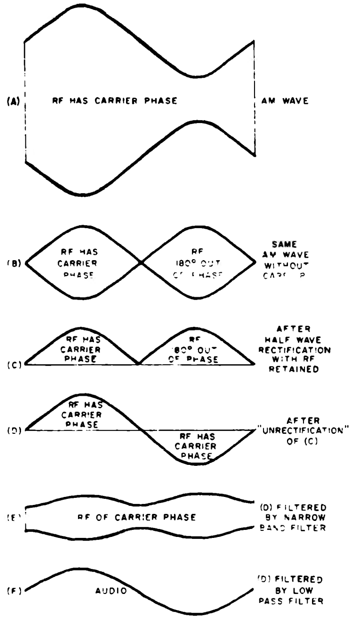

FIG. 1 RD WAVEFORMS

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* See also:

R. S. Badessa, "A Communications Detector with Signal-Synthesized Reference," IEEE Int. Conf. on Communications, 6/71.

S. Oldberg, W1SNN, "Reciprocating Detector: This novel circuit has many advantages over conventional detectors since it automatically adjusts its BFO level in proportion to the average signal level," Ham Radio, March 1972. Followup, late '72.

r.f. component 180° out of phase with the original carrier; of course this requires comparison of the r.f. with a local reference of carrier phase, which we don't actually have, but suppose for the moment that we do have such a reference. I will explain later how the circuit actually performs the operation.

For the present, notice that the flipping-over of the selected portions of the waveform has not only restored the negative half of the audio cycle, but has also polarized the r.f. components so that all parts of the waveform have the same r.f. phase. This means that a carrier has been restored. We can isolate it with a narrow-band filter (a bandwidth of 500 Hz or less is typical) and remove the audio with a low-pass filter. These components are shown in fig. 1 at (E) and (F) respectively.

As noted, the process of converting (C) to (D) requires comparison of the signal r.f. with that of a local reference, but since the narrow-band filter has inertia and its output is at the correct frequency, the r.f. of (E) can itself be used for this purpose.

This may seem like picking oneself up by the bootstraps, but its really no more so than any other form of regenerative feedback.

The process of taking a DSSC waveform and reversing its polarity at opportune moments to get the continuous carrier phase of fig. 1 (E) may suggest the conversion of translatory motion to rotory motion in a mechanical reciprocating system. Hence "RD".

The Basic System

Fig. 2 shows a basic RD system. Transistor Q3 is biased virtually at cutoff and serves as a half-wave rectifier for the incoming signal and also as a current source for the emitters of Q1 and Q2. The reference on the base of Q2 enables it to conduct on the positive reference peaks. Because the emitters of Q1 and Q2 are driven by a common current source, Q1 is enabled to conduct when Q2 ceases to conduct -- i.e., on the negative reference peaks. But since neither Q1 nor Q2 can conduct unless Q3 is also conducting (which it does only on positive r.f. signal peaks), it follows that Q2 conducts whenever the r.f. of the signal is in phase with the reference and Q1 conducts whenever the r.f. of the signal is 180° out of phase with the reference. Since the audio and r.f. outputs are obtained differentially from the collectors, a transfer of conduction from Q1 to Q2 or vice versa causes a reversal of output polarity, ie, the flipping action required to convert the waveform of fig. 1(c) to that of fig. 1(D).

The Question of SSB

So far we've talked mostly about the synchronous mode. Oddly enough, people generally have more difficulty understanding the non-synchronous condition. "How in the world", they ask, "does it detect SSB?"

The easiest way to understand this mode is to realize that without feedback the circuit of fig. 2 is basically a conventional detector; though I'll grant that the use of half-wave rectification of the signal in Q3 may be a bit unusual. In other words, if a fixed Local Oscillator is substituted for the reference presently driving Q2, detection of SSB signals occurs in the regular way. The question, then, should more properly refer to the generation of a reference to detect SSB rather than to the detection itself.

Suppose we were to replace the input signal presently driving Q3 by a d.c. voltage. This voltage would be converted to a fixed d.c. current in the collector of Q3. Transistors Q1 and Q2 would now become a differential amplifier which, because of regenerative feedback, forms a simple oscillator operating at the centre frequency of the filter.

In reality the "d.c." on the base of Q3 is the average of the half-wave rectified signal. The flipping action mentioned in connection with DSSC operation still occurs, but the operation is difficult to follow on a step by step basis because of intermediate phases resulting from the

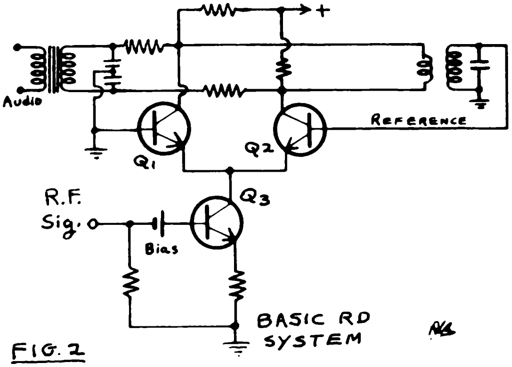

FIG. 2

frequency difference between signal and reference. In this non-synchronous mode the reference has a frequency that is no longer controlled by the signal, but it does have signal-induced phase fluctuations and an amplitude that is a filtered version of the signal envelope.

The Synchronous Bandwidth

When a DSSC signal is tuned in on a receiver equipped with an RD, synchronous detection takes place over a band about one-third the passband of the narrow-band filter -- i.e., over a band perhaps 150Hz wide.

If the receiver is mistuned beyond these limits the detection becomes non-synchronous and DSSC operation is unsatisfactory. But for properly tuned signals the transfer from one mode to the other may occur without the operator being aware of it.

For example, an SSB signal that happens to have some unsuppressed carrier can by careful receiver tuning be detected synchronously. But if the carrier should disappear, as from propagation effects, the detection would become non-synchronous automatically, i.e., without requiring receiver readjustment.

The synchronous bandwidth of the RD is one-third the bandwidth of the filter only if the upper and lower sidebands of the signal are completely correlated. For example, suppose we are detecting a DSSC signal and an interfering carrier appears just outside the synchronous band (almost the centre of the signal spectrum). This interfering carrier causes an unbalance in the sidebands and a reduction in the synchronous bandwidth.

Eventually, of course, if the interference gets strong enough, the synchronous bandwidth is so small that receiver instability prevents synchronous operation. But notice that the reference never leaves the signal to latch on to the interfering carrier. This results from an interesting characteristic of the RD: the synchronous bandwidth is independent of signal strength. This is true over a wide dynamic range without reliance on any form of limiting. Since the interfering carrier is already outside the synchronous band it has to stay outside even after it has completely overpowered the signal!

Phase Synchrony?

You may question the usefulness of a reference that does not follow the traditional pattern of phase-synchronous systems; it has neither a quiver of phase nor a trace of amplitude modulation. Lets consider this further.

With regard to phase jitter, the peak deviation of a virtually unfiltered RD reference is incapable of exceeding 30°. This is not obvious, but remember that even a 180° phase jump in the incoming signal gets completely removed by the flipping operation.

So a filter with a bandwidth of 500 Hz or less will yield no significant jitter even if the "signal" is nothing but random noise! With regard to amplitude variations, the same filtering reduces fluctuations in the reference to such an extent that most of the drops to zero experienced by the signal envelope do not show up at all, and those that do show up occur at times when the effect is minimal. The maximum rate of these fluctuations is perhaps 250 Hz.

The Consequences

The consequences of having a reference amplitude that is a filtered version of the signal envelope deserves further attention, since it is the basis of the RD's impulse noise immunity. This will be taken up in Part II.

A parting thought: The circuit of fig. 2 is intended for explanation only and I wouldn't recommend it for actual use. You would probably get bogged down with problems such as insufficient gain, spurious phase shifts, etc.

Part II will present the schematic of a more practical arrangement with instructions for optimizing its operation.

XXXXXXXXXXXXXXXXXXXXXXXXXXX

THIS MARVELLOUS AGE

-- ((W.A. VHF News Bulletin, May 1971))

For the last decade (or is it longer?) we have been getting brainwashed about the wonderous life we will lead when the computers really take over all the work.

Well, the day seems to have arrived!

Recently one of our members changed vehicles, and as the new one was somewhat more valuable, the cost of insuring it was some six dollars and twenty-seven cents greater. The usual interim arrangements were made, with the account to be sent along later.

From here onwards we sever our connections with the stupid old fashioned ways, and plunge headlong into the Computer Era.

In due course, the account for six dollars and twenty-seven cents arrived, accompanied by a cheque for precisely the same amount. Not only is this new method a positive step in the battle against inflation because it stops unnecessary spending, but it also saves all that work involved in running around to get change, writing receipts, posting in ledgers and all that outmoded nonesense.....

((see also "Swoop" on p. 68 here))

POLITICAL CONSIDERATIONS IN THE PARTS-AVAILABILITY CRISIS -- A. G. Adams (VK4)

It is on recent public record that men at the helm of the two largest Australian consortiums involved with manufacture and supply of consumer electronics (Philips and AWA) have bluntly put to Federal Cabinet the question, "Does Australia want an electronics industry with a much greater measure of self-containment or does it not? It must make up its mind -- and quickly". Attention was drawn specifically to the run-down state of the industry in terms of components production, due to failures in government policy to provide adequate local incentives, notably suitable protective tariffs applying to this area of business activity.

These manufacturers are, of course, concerned most immediately with Colour Television, for which tooling-up has begun. Firm advice is being sought as to how far this should be proceeded with, in terms of investment. Will subsequent imports of receivers, spares, and subsidiary equipments, make extensive tooling programmes unprofitable -- as has been happening within the U. S. A., the U. K., and some European countries?

Unless positive assurances to the contrary are received it is clearly innuendoed that the industry for want of alternatives will meet its manufacturing committments in the best interests of public and shareholders by obtaining a substantial part of componentry via import.

To this date (July), to the best of my knowledge, no concrete decision bearing on this matter has been arrived at or announced by Government or the Manufacturers, though it could well be that a pact twixt all has been settled but not announced, nor are we likely to find its exact terms.

I have grounds for the conjecture that all major companies, now few in number and including Philips and AWA, with international rapports will receive even more favourable treatment than they have been receiving in respect of Tariff and Treasury permissions. This will give them increased dominance in the electronic bits and pieces field.

Leaders in the industry openly admit to a commonly agreed-upon internal policy of greatly increased rationalisation in manufacture. In practical terms this would seem to mean a reduction of competition within specific production areas.

Now however you adjudge this, and you will do it according to your politics and the kind of information you have at your disposal, one outcome is certain. Big Business will tighten up its resolve to serve primarily Big Business exclusively, and small business (with the amateur and experimenter on the outer perimeter) will be even harder put upon to make shift for essential supply and service. The only chance for practical survival for these essential minority interests lies in the direction of pressing vigorously for treatment of similar kind to that being demanded by Big Business.

If locally made components are to become increasingly scarce, and locally-distributed imports are to increasingly be restricted in kind and availability, it is indubitably just and reasonable that the small consumer -- be he manufacturer, trader, amateur operator or private experimenter -- be given equitable access to markets outside Australia for his component needs. There are more of these external sources than many are aware of. Tariff policies, as now formulated, offer little encouragement of such awareness.

A Proposal

With some diffidence I submit a tentative suggestion for the relief of the P.A.C. ("Parts Availability Crisis"). Readers who are concerned by the P.A.C. should bring this matter to the attention of their local M.H.R., and require him to represent it to the Prime Minister and those Ministers of his Cabinet to whose portfolios it is relevant.

Amateur operators and experimenters might fitly seek an assurance from their local Member that he demand on their behalf exemptions from (or very substantial reductions of) sales tax and duty on yearly purchase transactions up to some stipulated amount -- say $1000. The 27.5 percent sales tax levied on much electronic componentry is quite exorbitant. It cannot reasonably be justified for what obstacle it places in the path of what is primarily a recreational interest, a healthily constructive one yielding real benefit to the nation from the skills and experience it stimulates.

Should your MHR show himself reluctant to press your demands, or in a non-committal way attempt to fob you off with Signed Form Letters, he must be told in polite but unwavering words (backed by honest resolve) that he is not doing the job he was elected to do. And that if he does not fortwith represent your valid and lawful interests you will be energetic in using all fair means at your disposal to remove him at the earliest opportunity.

Should your demands promote discussion, keep the matters of P.A.C. in sharp focus and precise context. Do not be led or provoked into lashing out at broader issues which you may believe, perhaps rightly, are relevant to the P.A.C. It may be suggested that what you are demanding is "Not in the National Interest" -- or you might be asked how a loss in revenue you are proposing is to be made up.

Do not be drawn by such routine persiflage. You do but need to remind the gentleman that a national interest includes you or it includes nothing, and that you do not presume to instruct the Treasurer (without pay) as to how he should juggle imposts. Do I get the parts I need on fair terms or don't I? Do I get the same preferential treatment as big industry or don't I? If not why not -- a written statement, please.

Concerted persistent action by a sufficient number -- not necessarily a large horde -- of individual amateurs and experimenters could produce worthwhile result. As in many predicaments that threaten genuine private enterprise on the homely plane, self-help and initiative is the only way out.

To do no more than grumble at "they", or to nudge the other fellow to come up with a solution, indicates a serf mentality. It will achieve all the deprivations that such people deserve, I guarantee it. There is no real scarcity of electronic components on this planet.

Not yet, anyway.

Editor's Note

My article, "Component Availabiltiy -- II" has been deferred in favour of the above proposal by an active small businessman. In that article I continued last month's theme on what to do if components are not available, but surely Mr. Adams' proposal should take first priority, since it is a practical programme for ensuring that the components are made more widely available for everyone.

Certainly, as Jamieson Rowe points out in his excellent Editorial in the June 1972 Electronics Australia, manufacturers have been finding it increasingly unprofitable to handle small orders, and that "this situation is reaching crisis proportions..." Mr. Adams' alternative of stimulating inexpensive imports seems a sensible alternative.

There are also other problems, but I shall discuss them in these pages in a couple of months. Next month's installment is reserved for Rod Reynolds, who analyses some of the deeper reasons for the P.A.C., and concludes by supporting Mr. Adams' basic idea.

XXXXXXXXXXXXXXXXXXXXXXXX

((As relayed to us by our Assistant Editor, author not specified:))

I had eighteen bottles of whiskey in my cellar, and was told by my wife to empty the contents of each and every bottle down the sink.. or ELSE

I said I would, and proceeded with the unpleasant task. I withdrew the cork from the first bottle and poured the contents down the sink, with the exception of one glass which I drank.

I extracted the cork from the second bottle and did likewise with it, with the exception of one glass which I drank.

I then withdrew the cork from the third bottle and poured the contents down the sink which I drank.

I pulled the cork from the fourth bottle down the sink, and poured the bottle down the glass which I drank

I pulled the bottle from the cork of the next and drank one sink out of the next glass which I threw down the cork

Then I corked the sink with the glass, bottled the drank and drank the pour. When I had every thing emptied, I steadied the house with one hand, counted the glasses, corks, bottles and sinks with the other which were twenty nine, and as the house came by I counted them again, and finally had all the houses in one bottle which I drank. I'm not under the affluence of incohol as some thinkle peep I am, but the dunker I stand here the longer I get....

XXXXXXXXXXXXXXXXXXXXX

Quote

... And their studies of 200 miles of coastline have unearthed a point of some significance. The only 'plague' concentration they found was in the most contaminated part of the most polluted reef area on the coast.

The conjecture is that contamination deters fish or other predators which normally eat the eggs of the starfish. And since the female starfish produces as many as 14 million eggs, this could have a dramatic effect on the population....

In the end he believes the problem of the starfish is part of a bigger problem, with deep seated consequences -- the conservation of the environment and, particularly, man's relationship with the sea.

"It all seems to come back to this mistaken feeling that the sea is limitless, that you can never pollute it, and you can never overfish it."

-- Report by Tim Radford, London, on the Crown of Thorns starfish which is now happily destroying the Great Barrier Reef whilst the Federal and State Governments debate whose fault it was. (Hobart Mercury, 21/8/71)

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CRYSTAL SET TECHNOLOGY, Part I -- RLG

I have done a fair bit of research into crystal set design, and a nice article is in preparation (time permitting!) -- a preliminary report appeared in the March 1972 issue of the Radio Bulletin (April EEB for Review of the R.B.). But for now the conclusions can be set out here for the benefit of the impatient.

The diagram shown in fig. 1 will give performance as good as can be obtained from any crystal set, and better than most. In the Literature are innumerable designs for crystal sets, each claiming to be the "best". Many improvements they make are superfluous, others (e.g. various coupled coils) accomplish no more than the tapped system shown here. The capacitor often seen across the phones gives only marginal improvement so is omitted here (the phones seem to have enough capacitance). My design features a Signal-Strength Meter, and that IS unique! The fidelity obtainable with a good crystal set is marvelous, and I recommend such to HIFI enthusiasts; but if you are going to add a proper amplifier and speaker, you will need better selectivity than can be obtained with the simple system of fig. 1 here. This is possible by using twoparallel tuning circuits in place of one: capacitatively couple them with 5-20pF, and gang the capacitors. Details in Part II.

Essential points of fig. 1 are:

(1) The choice of diode taps is important, and should be adjusted for each situation. For most, the diode taps may be placed at about 30% either side of centre tap. Incidentally I should mention that when I specify some %, it is the number of turns represented by that fraction of the total number of turns on the coil. I do this because coils will differ.

This gives a good balance between selectivity and sensitivity. If a loud signal is more important than ability to separate stations, taps may be placed further out, e.g. ±50% either side of centre (viz, right across the ends of the coil).

(2) The antenna and earth taps will depend very much on the length of antenna. A 20-metre length will need about ±30% taps (either side of centre), but this also depends on selectivity desired vs signal strength (the two are in conflict). Running the taps toward the ends of the coil gives a louder signal at the expense of selectivity, and conversely.

As the antenna is made longer, the optimum A/E tap will decrease, i.e., both go closer to the centre-tap. When the antenna is $\lambda/4$ (eg 100 metres) long, the taps should be only about ±7%. Still longer antennas require more turns again, and give stronger signals; I had a glorious opportunity for some research on this recently when visiting a farm!

(3) The antenna tuning capacitor (C2) is necessary only when the antenna is non-resonant -- which will be most of the time for anyone except a farmer (ah, that farm; I could have set up a Rhombic on 600M!). C2 is adjusted with the tuning capacitor (C_1) for best balance between signal strength and selectivity: Start with C2 at max, tune C_1, readjust C2 for best volume or minimum interference from nearby signals.

(4) The diodes must be germanium, and preferably selected for best results, particularly if computer board types. To test, use only half of the balanced circuit, and substitute diodes until maximum output is obtained (e.g. as read on meter)

(5) High sensitivity earphones are best; the higher their impedance the further out the diode taps can go whilst retaining good selectivity. Crystal earphones would probably be best, but must be isolated from d.c. by a 0.01µF blocking capacitor, and the d.c. return must be provided, preferably by a choke.

(6) A good earth connection is essential! Do NOT use the mains earth. A water-pipe connection is bare minimum; a good counterpoise is even better -- See RSGB "Radio Communication Handbook", pp 13.46 to 13.48.

Where a large amount of space is available (e.g. 200 metres in a straight line), quite good results in lieu of an earth connection are obtained if wires are fed from the "A" and "E" terminals, and run in opposite directions, as high as practical. This is, of course, a dipole.

(7) The meter shown in fig. 1 actually measures signal strength; an S-meter on a crystal set! A 50µA movement will be all right for 20 metres or so of antenna, or 500µA for 100 metres (if room). If you want delicate tuning for weak signals without pinning the needle on strong ones, a 50 or 100µA movement can be used by inserting a resistor at "X" and a silicon diode as dotted in. Increase the R until meter reads only FSD on the strongest signal. This was quite necessary at our location, because 7HO brought in some 500µA (2000mV of signal!) while 7ZL developed only 20µA, with a 110 metre antenna.

(8) A simple transistorised amplifier may be fitted to give superior results from magnetic headphones, as in fig. 2. E may be anything from 0.3V upwards. A solar cell works well. A penny and six-

→ P. 61

"You won't get rich advertising here, but you'll see your name in print" — Wayne Green (73 Magazine)

EEB Staggers On

I had every hope of producing this issue moderately "on time", but I have been deeply involved with measuring the fallout freely exported to us by the French. There was fallout in Hobart, of course, but it was small. It will be even less in drinking water than in the rainwater measured, and the dose will be insignificant to ordinary body cells. But it does add somewhat to genetic effects, viz., damaging your children's heredity...

A rather interesting observation happened in the course of measuring background radiation. There was a considerable increase of cosmic ray activity about noon on July 7, and this coicided with an unusual propagation condition which allowed communication between Tasmania and Queensland on 10 metres. It occurs to me that one could watch for band openings merely by connecting a simple radiation-counter to an automatic alarm system, arranged to give indication when the background exceeds a certain level. When the bell rings, jump up and turn on the receiver! Does anyone know anything about this kind of thing having been done before? Incidentally, in February we printed the circuit of a transistorised Geiger Counter preamp...

In preparing the various articles for this issue I simplyattacked the large stack of manuscripts etc and typed and typed without counting pages. When I put it all together I found that there was enough material for another year's worth of issues, at 15 pages of Offset copy per issue. I've been working harder than needed!

I don't know how we'll get everything printed. We could increase the number of pages per issue, but that costs money, and it doesn't look as though we've got much chance of getting much real advertising.

We contacted a number of potential advertisers (no I didn't really give it away completely) for this edition which is being printed in some quantity for promotion. We offered advertising at somewhat below cost level, to present evidence that there are indeed a number of useful component suppliers in Australia. The only one to take the offer was Kitsets-Aust, who have been advertising with us for several years. Kitsets' advertising has been a mark of confidence in EEB, and a recognition that Electronics Experimenters are the ones most likely to buy electronic parts -- and that my tirades against commercialism are directed merely against abuses of commercialism. If you buy from Kitsets, do let them know that you come from EEB -- and I'd recommend their thick Catalogue to you. It contains an amazing amount of stuff, and is well worth its price of 50c, likely about cost price for that item.

Omissions, etc.

In Yelland's "Threshold-operated Null-Point Amplifier" last month, p. 31, please note that the polarity of the diode, D_1 should be the other way about; please correct it now while you are reading this. Thank you.

As mentioned on p. 45, I must apologise for not having included Burlinson's promised article on Light-Beam Communication this month, but when everything was assembled there was no room left. But it will have an advantage that it will be presented in two instalments rather than 3.

I'm afraid you may be noticing some worsening of the quality of draughting of diagrams in EEB, but it can't be helped. Rod is now too busy to do our draughting, and I have been doing it myself, as possible. I hope to find someone who will do it for us, but the problem is, of crse that the pay is rather poor — but quality need not be exceptional either. Anyone in Hobart interested?

Ici Je formalise ("ICs Forever")
(or: "Leggo for experimenters")

Last November I asked whether you would let me know when EEB became Banal. We have, it appears, a candidate, who comments:

"I recall that some years ago the Editor expressed disapproval of the use of ICs on the grounds that they took the pleasure out of constructing things oneself, in amateur electronics. I never dreamt that that opinion would be put into magazine policy and have such drastic effect after so many years.

"Digital ICs are below \$1, and Op Amps of incredible performance less than \$1.50. On seeing two correspondents solemnly describing two devices (counter and null-detector amplifier) using several transistors when one IC would do a superior job in each case, I realised that the EEB had become quaint.

"If it is the magazine's intention to convey new ((PTO)) information, then the present policy will need to be altered. Alternatively, you don't mean what you write concerning picking up the circulation.

"A further point I wish to make is that EEB caters almost exclusively for the Ham (sic) or R.F. work. Many persons like myself are interested more in electronic devices and circuits which can employ the more recently developed components."

— G. N. Boyd, North Balwyn, Victoria.

- - - - - - - - - - - - - - - - - -

Looking back through Editorials I see that his accusation is indeed correct that I have not favoured the use of ICs, for reasons well stated on pages 68 and 76 of the 1969 EEB. But 1969 was also a turning point when we published our first IC circuit (p. 26), and when I began to state tht ICs may have their uses.

Since then I have described in detail some of the remarkable circuits available through the use of ICs (and a large part of them in the field of communications which our correspondent doesn't prefer*), and if there is such a thing as an EEB Anti-IC Policy it has certainly been modified by Progress. I would also note that I have never refused an IC article of good design, though we have turned back some which did not meet that qualification (c.f. Oct 71, p.79).

In December 1971 I questioned the value of packaged circuits on the basis of human values, but the fact does remain that ICs are becoming a greater part of electronics and if we are to have to live with them we must learn how to live with them intelligently.

In late 1971 I argued at length about the need to adopt a receptive attitude to new developments of every sort, and I must swallow my own medicine. I also note that in Nov. 1971 we published an IC Squaretable in which a variety of points was brought up pro and con, well illustrating my Editorial comment, "Let commonsense rule: use a semicon or IC where it can do a better job (for whatever reason), and only then."

It appears, however, that the time has come to examine further the conditions where that applies, and EEB's place therein:

EDITORIAL - 2 — by Rod Reynolds, VK7ZAR (Asst. Ed.)

— The Place of ICs in Electronics and in EEB.

An EEB Policy

Some years ago the Editor spelt out a policy of avoiding the then relatively new integrated circuits on the basis that:-

1. From the educational point of view the discrete design of electronic units would be lost.
2. At that time circuits using recovered computer board transistors and components were considerably cheaper than the equivalent available ICs ((they still are, for the small-circuit ICs — RLG)).
3. ICs generally available were of limited performance and of high susceptibility to transients etc.

Several recent letters and personal observations have shown that this policy could well be still in force. Certainly perusal of recent issues of EEB brings very little evidence of ICs being considered. But this is only partly true.

ICs have their place, of this there is no doubt. It wld be and is feasible to build complete systems using nothing other than ICs (as RLG has indeed pointed out in his articles on Receiver Design in recent issues) at a considerable saving of cost, reliability, and space compared to an equivalent unit using only discrete devices. There are, however, several other points that should be considered:-

Extenuations:

1) Many EEB projects are just that — they are experimental, and are well suited to discrete devices. Discrete device practice is often excellent in illustrating design principles, and indeed such design principles must be understood thoroughly in applying IC technology. Would you have us describe an electronic counter stage to beginners in terms of Black Box theory? There's time for that later.

2) Most EEB projects are the result of the work of our contributors, and if these people choose to contribute discrete device articles, this is what we print. There is nothing particularly wrong with that, and it is not necessary to use ICs for simple circuits. In any event the fact remains that very few suitable articles have been submitted using ICs.

The last-mentioned point is, of course, no defence for not using ICs, but it does explain that we have not deliberately discriminated against IC articles.

Perhaps it is time to restate the policy ((cont. p.55)) of this magazine, if it can be said that we are well-enough organised to possess a policy, in regard to the proposed use of and solicitation of IC designs.

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* We also receive letters telling us we have too many articles on power supplies, inductance bridges, transistor testers and automotive topics — and not enough on Amateur (not HAM) matters... Jacque's son has the gout.

The Use of ICs

There is no doubt that a vast financial saving is achieved by using ICs in Industry. Consider the case of the desk-top calculator where performance and features can be provided for a tenth of the cost of a similar unit which uses even small-scale integration, and at a very small fraction of the cost of a unit using discrete components — to say nothing of the size. A modern hand-held calculator contains of the order of 30,000 equivalent transistors, i.e., if TO-5's were used this would occupy over 15,000 cubic centimetres (that's 15 litres!) of well-packed transistors alone, to say nothing of the rest of the equipment!

Most of the IC types normally considered by the experimenter will be rather different: there is for him a real place for the linear IC and the smaller digital IC (up to, say, BCD Decade converter) in his designs. According to RLG's "commonsense" rule, ICs apply best here because they can do a better job than anything else.

Or, consider Phase-locked Loops using a single IC. They are more convenient than those using discrete components, and some of EEB staff are considering the use of them in planned equipment — although one of us is still in favour of a valved PLL ("only 7 valves!"). Each to his own taste, but one would imagine that one Black Box would be simpler than 7 transparent ones (plus resistors and the rest).

As an Engineer I will use ICs where they are called for. But there are some areas where the use of an IC, even if available, is rather pointless, e.g. an HF flip-flop where high current output (say 100mA) is required. Two transistors will provide this, or one IC plus transistor driver.

Discretes are also preferable where there are special requirements for frequency, power or voltage; indeed valves may prove better for this than transistors — as is the fact in the new colour TV sets, which use mostly ICs and valves. Discretes may also be specially useful for other special requirements such as core-drivers, interfacing between ICs, or something particularly simple such as a single common-emitter stage for impedance transformation. But for most "ordinary" circuit functions the ICs win.

So — wheel out the designs that use linear amps, pwr amps, TTL, RTL, and eventually MOSIC (viz, IC FETs) where convenient, and they will be added to these pages.

((BUT PLEASE PLEASE SPECIFY WHAT THE FUNCTIONS ARE FOR THE VARIOUS PIN NUMBERS ON THE B.B., SO THAT OTHER PEOPLE MAY MAKE ALTERATIONS OR USE ALTERNATIVE ICs IF DESIRED!—RLG))

We leave it to you. The EEB staff have quite enough to do in putting the magazine together without leading the field in the development of these circuits and articles. The large periodicals and trade papers are available to these people who want doses of IC technology. And in magazines such as Electronics Australia or Break-In, QST, Ham Radio, or Wireless World you'll find an often balanced mixture of discrete and IC circuits, as well as articles on IC fundamentals. EEB has its own unique function — only a part of which is to present circuits.

A Logical Development

The apparently revolutionary changes being wrought by ICs is a logical development of electronics. We all assume that we can buy a 390pF (or whatever) mica condenser off the shelf, but it was only 50 years ago when the experimenter who wanted 390pF made it out of a couple of pieces of Bakelite, some silver sheet, and mica.

The time has come when the breadth of design need not deal with the detail of what components to use in a circuit, but with what circuit block to use in a system. One then arrives at the current state of system design in much the same way as our pioneers changed from component design and manufacture to circuit design and building during the 1920's.

It might be argued that modern design had arrived even a few years ago when the Editor of EEB stated his opinion on ICs, but the devices were not generally available, and those available were of relatively high price, dubious reliability and limited use. This no longer holds; price is low, reliability approaches that of passive devices, and each new advertising note announces new ideas for ICs which cost less

Why not give them a go?

Don't Panic!

These ideas need cause no distress amongst sincere discrete-electronics enthusiasts, and our good Editor can wipe that stricken look from his face. We will certainly accept articles using discrete components where relevant ((and for a long time even when merely convenient! — RLG)), but we now seriously encourage experimenters to stock up on ICs as you would have done for transistors when they first((cont.,p.57))

((Anyone want to join a Baby-sitting Cooperative Club in the Sandy Bay area? Phone 237-670))

ADVERTISING

— we guarantee nothing

ADVERTS FREE TO PEOPLE (only)

((cadavers emptied))

THE NEW SOUTH WALES DIVISION of the W.I.A. is pleased to announce the appearance of the Magazine "6-UP", dedicated to VHF, beer, and assorted useful comment and announcements. Good homebrew gear is featured. The article on FETrons in the July issue scooped all the Australian electronics journals. Current feature article is treatment of theory of Phase Locked Loops, to be followed by various applications. Subscriptions by post, $1.50 per annum; distributed free at the Sydney VHF Group Meetings (W.I.A.). Write, "Editor, 6-UP", 14 Atchison St., Crow's Nest, N.S.W. 2065.

WANTED: Old World War II portable type transceivers in unmodified or slightly modified condition, with the service & operator Handbooks — such as No. 62, No. 19, No. 122, FS6, No. 11, or any other types known in that period. I am willing to pay reasonable prices for the above. Should anyone know of other types made and used in Australia during WW-II, I would appreciate any information supplied./ R.D. Champness, 24 O'Dowds Road, Warragul, Vic., 3820. (VK3UG)

FOR SALE: BC221A frequency meter in very good condition. Best offer.
— A.J. Van Genderen, 15 John Street, Ashfield, N.S.W. 2131.

WANTED: C.Ray Tube ECR30 or VCR139a. Write:
B. R. Williams, 284 Rocky Pt. Rd, Kogarah 2217

WANTED: Old ARRL Radio Handbooks for Youth Radio Class. Cash paid. Books need not be in good condition. Write EEB

COMPUTER BOARD COMPONENTS: 15 transistors, 15 diodes, 15 resistors, $1.00; postage 10c for components; with 4x2½" board, 15c. Write: L. Mac Donald, Geelong Road, Buninyong, Vic. 3357.

COMPUTER CIRCUIT BOARDS: 10c per transistor, all other components free. Transistors are high quality germanium, PNP or NPN (specify). Data notes, 20c extra. All postpaid. EEB, 32 Waterworks Road, Dynnyrne, Tasmania 7005.

SUBSCRIPTIONS at very low prices, special EEB arrangement (for Australia only): CQ Magazine, $5 per year; Ham Radio Magazine, $8.50 per three years. These are the lowest rates in the world. For you, while they last. Write EEB at S.B.

BOOKS AT LOW PRICES: Obtain the best and latest U.S.-published books, as reviewed and referred in the EEB and elsewhere. When ordered directly from the USA you can save a lot compared to Australian bookdealers price, and the difference between $A and $US often pays for most of the postage. A small commission is charged. $US drafts can be obtained from any large bank. SEND your orders to:

HOOD's Books and Amateur Radio Equipment, P.O. Box 32064, Oklahoma City, Oklahoma 73132, U.S.A.

EQUIPMENT AND OVERSEAS COMPONENTS AT LOW PRICES: Some components are difficult to obtain in Australia, particularly the newer types. It can be worthwhile sending to America for them. Prices will generally not be higher than Australian, and often lower. Receivers, Transmitters, Test Equipment of American origin can almost always be obtained more cheaply directly from the U.S.A. than through middlemen in Australia — even after Customs Duties! We can put you in touch with reliable distributors of a number of makes of equipment (though not all), with special reference to the "DRAKE" line. Write EEB, specifying your requirements specifically as possible. Answer will be forthcoming in due course.

If you are considering this kind of importing, check first with your local Postal Customs Office. Orders under $A40 (about $US47)can always be handled with negligible red tape. Orders over $A40 require merely that you fill out some forms; by using a bit of intelligence in filling them out you can bypass the expense of a Customs Agent for all

but the largest transactions.... So, contact EEB if you want to import components or equipment from the U.S.A.

EASTERN SUBURBS ELECTRONICS CLUB, Box 62.042, Sylvia Park, Auckland 6, New Zealand, was formed recently to bring together all those in the Eastern Suburbs who have an interest in electronics as a hobby.. Many benefits. Write for detail

HIGH QUALITY COIL WINDING MACHINES at reasonable prices. Details in the February 1972 EEB.

EDITORIAL (cont. from p. 55)

became practical. Even RLG's desperate comment in brackets above (bottom p.55) may turn on him; when you have on the shelf an IC which will give you lots of gain or power or whatever, will you bother to construct the equivalent discrete circuit (and to troubleshoot it!)? Which will be more "convenient"?

Consider, for example, the Power Supply Regulator described in the June issue of Electronics Australia (a magazine which is shaping up quite nicely under the stimulus of competition). With one MC1469R IC and a transistor it gives 0.03% regulation at 400mA. You'd have to have something rather more elaborate than the usual discrete circuit to accomplish that. And it would cost more and wld be much more trouble to construct. This IC has only 10 connections. What could be easier?

If you are afraid of ICs, use transistors, FETs, or valves; we aren't going to force you into anything. But if your friends get the same (or better!) results quicker and cheaper with ICs won't you feel that you're carrying water in a bucket when a motorised pump lies nearby and you need only to press the switch? Eventually it will be as pointless to build individual circuit blocks as it is now to make your own condensers. After all, you are perfectly free to make your own condensers, no one will stop you, but who bothers?

((Ahem... In February we printed an article telling how to make your own condenser, when the home-made article could do a specific job better than commercial ones.--RLG))

When to do it

In any event, as I say, we shall for some time accept all manner of articles still using simple discrete components, but we will sometimes point out where these might more easily be replaced by suitable ICs. On the other hand we will take a rather hard look at complex circuits whose circuit elements could more profitably be replaced by integrated circuit blocks, e.g. complex d.c. amplifiers using discrete components when an Operational Amplifier ("Op Amp") could be used to better advantage.

As a starting point for this policy, we are going to do some surgery on the detailed circuit for Burlinson's Modulated Light Communication system in the third instalment of his article, presenting the simple amplifiers as noncommittal triangles, but specifying gain and impedances.

Even if you prefer to build your own amplifiers from discrete parts, basic transistor or FET amplifier design of the usual sort has become so cut-and-dried that there is hardly any excuse for us to reproduce it endlessly! Articles on the subject in the periodical literature (the OTHER periodical literature) are endless, and information on simple amplifier design can be found in all important handbooks and texts.

How to do it

If you've joined the throng, how do you find which IC you want? Easy, the same way you did for valves and semicons: consult a ready-made circuit, or (much better) make your own by consulting the "short form" IC catalogues. These are available from Fairchild, Philips, Rutherford, Motorola, STC, AWV/RCA, TI, etc. You obtain the unit you want, from your local parts distributor or from the several components retailers who advertise in the national magazines here or abroad; for overseas buying, see last month, p. 35, or the Advertisement here above.

If you want to modify an existing circuit you merely use the same technique and a bit of sense. For example take the Automotive Voltage Regulator in the July Electronics Australia. Its simply a voltage regulator like any other voltage regulator, but its output feeds the field winding of the generator. So, simply take a voltage regulator such as used in the abovementioned June E.A. P/S article, feed it into an AY8149 or 2N3055, etc, and thence into the field winding. Simple? If the sensitivity wants to be better, put a bit of series resistance in the sensing lead.

Of course an ordinary mechanical voltage regulator for a car is more effective, more reliable, and gives higher output — so why bother with the semicon version, discrete or IC?? As RLG would doubtless say, " a thing's not worth doing unless its worth doing better". Simple "comonse". Electronics is a tool, not necessarily a goal. ((PTO))

Courage!

Do you have the courage to enter this new age? Read RLG's "The State of the Art: A Crisis?" on p. 79 of the October 1971 EEB. And perhaps too the exchange of ideas by J. Fisk and O. Hello in the 1970 EEB (p. 130 and 150). Such ideas are the real value of EEB, not the trivial question whether we publish too much Amateur or too much non-amateur material.

* * *

EIDTORIANIF No. 3 — RLG again: On the Making of and the Reading of Literature Reviews....

For this issue I had prepared a Literature Review of some interesting recent items with comment, albeit in the field of communications (perhaps thereby to interest some people who might not otherwise be?), but the above material took obvious precedence. But do take a look at July A.R.*

My reviewing activities tend to be fairly desultory, owing to lack of space, and to the fact that the kind of people who enjoy that are a rather small (but keen) group. For those people I would recommend as a steadier diet Pat Hawker's excellent monthly "Technical Topics" in the British Radio Communication; see your Library; State, WIA, or NZART — or (better) join the RSGB (35 Doughty St., London, England). A much shorter but interesting summary of a wide selection of literature is found in W5JJ's Collector & Emitter. These are, however, mainly concerned with communications. I'm not sure what equivalent service exists for The Rest, but I think it could depend on what interested one; there is rather a lot of electronics outside of communications! Anything from Practical Electronics through Radio Constructor, to Wireless World, thence to the Proceedings of the IREE. These named are British; the American equivalents aren't of much value, e.g.: Popular Electronics, Radio Electronics, etc. Proc. IREE is, of course, very informative if you are at that level, but on the whole I don't know of a good monthly summary of the general experimenters literature. Do you?

THE CANADIAN AMATEUR RADIO TELETYPE GROUP

We have been introduced to this group through Frank Merritt, VE7AFJ, an EEB subscriber. Their Bulletin, RTTY News is published monthly and contains information of technical and communications interest to teletype enthus. I have been more interested in this mode of communication, and it may even induce me to get on the air (anything is possible), particularly if Rod ever moves out of Hobart.

From the July 1972 issue, there are a couple of items I should like to quote here, the first one a point which I have wanted for some time to mention here, and the second is presumably relevant to Rod's IC orgy, above.

Tracks in the Sand — VE7AFJ

The notebook is a powerful tool to the electronics experimenter. It really does not make much difference what the notebook looks like, the important thing is to keep a notebook of pertinent station and experimental information.

One of the main reasons for keeping a notebook is to reduce the necessity of "re-inventing the wheel" from time to time. Very few operators/experimenters have a true protographic memory, so some form of written "memory" is a good idea ((It is essential — RLG)).

Another interesting aspect of the matter is that of taking photographs of the station periodically. A scrapbook can be used to collect scraps of memorabilia for future reference. The generous use of photos brings back many memories as the years roll by.

TTL all the Way — VE7AFJ

Most of us would use more of the developing IC technology with a better background and understanding of the concepts. For the most part, this knowledge is hard to come by. The EPD (Environmental Products, Box 406, Lafayette, Indiana 47902, U.S.A.) people have published a set of Application Notes that provide much of the basic background needed to use IC products. These Notes are available in Canda for $6.00; Investing in them is just about the best investment for the serious experimenter. The technology is reduced to a digestible point emphasizing the PRACTICAL use of these products. Get smart — it really does not hurt.

* * *

I'd say that thinking does hurt, but the rest sounds reasonable, save for Rod's murmur that the notes probably stress the use of the manufacturer's product, but I reckon they're probably still worth it. $6 in Canda can't be much more than $7 here, and our $ is worth 15% more, so....

For those who are interested, it costs $2 per year to belong to the CARTG and receive their bulletin; as long as you are getting a draft for North American dollars you might as well send for a subscription too: Canadian Amateur Radio Teletype Group (VE3RTT), 85 Fifeshire Road, Willowdale, Ontario, Canda, I mean Canada.

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*particularly "Newcomers Notebook" by Rod Champness, VK3UG. A very sane approach to circuitry, and not only beginners.

WHERE THE DX IS AT ! — Greg Johnston, VK7KJ

G.M.T.	CALL	NAME	FREQ.	QTH/QSL INFORMATION
From the home station log:				
0434	5X5NA	Roger	14170	via G3LQP
1409	7P8AC		14234	
0400	VP2VV/FS7	Yvon	14172	via F6AEV
0400	FH8CY	Yvon	14172	Box 438, Moroni, Comoro Is.
0330	5H3MM		14171	
0350	VP1BH	Bob	14171	
0404	LZ2WC	Vecso	14208	As per Callbook.
0400	5H1LV	Garth	14172	Zanzibar; via K3RLY
0430	5H3LV	Garth	14172	Tanzania; same op;via K3RLY
0540	ZK2DX	Jim	14178	Niue; via WB5BHN
0551	CR6GA	Guy	14178	Angola; via WA3HUP
0718	VR4EE	Jacques	14183	P.O.Box 400, Honiara,Solomon Is.
0408	JY6SE	?	14202	Jordan. Vy QRM es weak sigs
Per Courtesy Geoff Watts DX News Sheet:				
0330	SU1MI	Moona	14036	Via W3HNK
1625	TL8RD	Rene	21200	Box 22,Bangassou, Central African Republic.
1500	TRAF	Brutus	21270	Box 208, Libreville, Gabon
1450	XU1AA	Tony	14228	Box 262, Johore,Bahru,Malaysia
1000	XV5AC	Chester	14150	Via W1YRC;this one is legal!
1350	ZB2CC		14170	
1315	ZK1MA	Tuatai	14176	Manihiki
1200	ZS2MI		14220	Marion Island.

((Ed. Note: I have put it down as Greg gave it to us, and have not bothered to fill in the country of every listing. Presumably only DX people will be interested in this, and they will all have a list? Or does anyone object? Personally I find those faraway places and new nations interesting, just to know that they exist...))

Minerva Reef — Whose is it????

My own excursion around parts of the Southern Pacific recently has been mentioned in the past two numbers of EEB and the projected short stay on Minerva which at the time was one of the few remaining lumps of rock unclaimed by any nation, was alluded to therein.

A New York and London-based organisation calling themselves "The Ocean Life Research Foundation" declared the Republic of Minerva and said it would build a sea city some time in the early part of the year, but the detail is not forthcoming from sources available to me. All information up to time of my departure indicated that the place was indeed still not claimed in any official sense and was thus "open go" for a DXpedition such as I planned. Hence after something like 2600 sea miles aboard "Winston Churchill" (52 foot Aux. cutter) from Melbourne to Eden to Whangarei (N.Z.) a very hairy ride out to near the southern end of the Kermadec group in Force 9 to 10 "breezes" which effectively discouraged any landing attempt, we found ourselves 50 miles south of the Reef at 2000 GMT on May 21st. in heavily overcase conditions with very little wind but every prospect of some developing rapidly.

The baro had started a rapid descent from 1028mb and within a short time we had the leading edge of a good Southwester as well as a very confused and heavy sea.Dave, ZL1AV, was able to obtain an up to date met. report via land-line ex Fiji (the Suva coast radio station did not acknowledge our calls for same despite the fact that we were in contact with both Auckland and Sydney coast stations — this indicated that we were getting out quite well enough to get into them on the commercial channels used!) which was a bit more cheering than the aspect of the weather which was then confronting us with the wind veering around to the North East and making in strength (We all thought: CYCLONE!) with the baro. down to 1009 from 1028 in only 5 hours.

At this stage we were an estimated 25 miles south of the Reef (2400 GMT, May 21) and debating the advisability of attempting a closer approach in the absence of an accurate sun fix; the latter was not possible in the lousy conditions and overcast. The problem was crystallised by some anonymous "breaker" on 20M who tipped our likely arrest should we actually land on the place. This swung the day and we gave up the attempt and headed on to Suva where we learned that King Taufaahau Tupou of Tonga had laid claim to Minerva and that Tonga was exercising territorial rights over a radius of 12 miles north and south of the Minerva Reefs.

It sounds like our anonymous informant was substantially correct and in the light of yet further information I for one am very glad that we aborted the proposed operation from there. 'Nough said, but it does seem clear that any operation from Minerva will now count only as Tonga.

Apart from the all too obvious frustrations involved in the amateur operating schedule the balance of the trip was an experience which won't be easily forgotten, and about which one could easily write a book... The only catch wld be that my YF would refuse to have anything further to do with me!!

LETTER:

Enclosed please find a cheque... for a renewal of 3 yrs. I like your magazine and its informality very much — but I have noticed the trend lately from articles to reviews to now just bibliographies. If I had enough time I would be reading all these magazines to find out what else is in them as well, but to pick up an EEB to get a list of references interspersed with only a few "bon mots" is a bit disappointing.

The finer points of design I find very good.

— J. Mack, VK2BME, Cheltenham, N.S.W.

SOME INTERESTING COMPARISONS (1971 EEBs):

Subject	Note	FEB	APR	JUN	SEP	OCT	NOV	DEC	AVG TOTAL
Construct.	1	21%	11%	0%	14%	18%	0%	21%	13%
Design		21	36	0	12	16	37	24	25
PblcInterest	2	18	8	73	18	33	13	3	16
Letters		18	12	0	22	13	6	13	13
Reviews	3	15	14	0	15	3	13	5	11
Bibliography	4	0.2	1.6	0	0	0	11	12	5.1
Adv+Miscel.	5	8	19	20	21	18	20	21	17

NOTES:

1) Figures rounded off. Usually about three constructional articles per issue, a reasonable balance.

2) Mostly technical, but includes examinations of goals in technology, and often overlaps with "Design" or "Reviews" in the deeper sense of the word (Note 3).

3) This can be ambiguous. Some Reviews would be classified under Design, some under Bibliography. It may not be fully appreciated that our Reviews attempt to be analytical, attempting not only to tell you what is available in the best literature, but where and how it fits, aince nothing is perfect, nay not even me.

4) Similarly it is not always appreciated that our Reference Lists usually do far more than tell you where background literature for a subject can be found. Often we have made detailed comment on each article, telling its essential context, and allowing you to benefit from the coverage of a substantial amount of technical reading without having to go to the trouble of reading it yourself! This is a tremendous lot of work, and most of the comments about it have been complaints. Bah humbug.

5) Obviously this won't necessarily add up to 100% total, since figures are rounded off.

For the current year a similar analysis gives similar results. CONCLUSION: Coverage of the various subjects tends to be more or less even, with an emphasis on design — though this is fortuitous more or less, and varies from year to year — and less on Reviews. Reference Lists take a very modest fraction of space in our magazine.

Since, however, several other correspondents have also commented on the "extensive Reviews and Reference Lists" it would appear that a little of them can go a very long way, even with the qualifications embodied in Notes 3 & 4.

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

PUZZLE: (L.J. Yelland) Try, then see Back Page, this issue. A 240V series motor is geared 5:1 with pulleys and drives a load at 1000RPM. To obtain a higher speed the pulleys were changed to give a ratio of 2:1. Result was a REDUCTION in speed of the load. Why??

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

LETTER: Alas, poor Langford-Smith...

Tell Rod that I will have a copy of the "Amateur Radio Designers Handbook" as soon as he has it published. I think, however, that the book he describes in the Feb 1972 EEB is one which is too good to be true.

Keep up the good work.

— W. B. Ricketts, VK5ZWB, Cleve, S.A.

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

LETTER: Some Uses for EEB

Your little paper has done wonders for me with solid state. I have tried so many transistor projects and never had one of them work, even only very simple things. But I never understood what I was doing, and if it didn't work I was lost. So I stayed with valves; simpler to understand.

Then your encouraging magazine came to me... and you encouraged me enough to try again. My first project was a crystal detector and fed into the base of a transistor running from the test prods of my multimeter.

Contain your mirth! That gave me more encouragement thn any of the subsequent projects that have worked. It wasn't until I finally got down to first principles and understood what was going on that I started to learn anything... and now my electronic projects really work....

— Graeme R. Flodine, VK4FR, No.Tamborine Pt., Qld.

((Apologies for omitting the rest, but no room; we receive a large amount of mail, and it can't all be published. But we do seem to print much of the better part sooner or later)) pence (or any real silver*coin) work well; two pair of these work even better. A cent and 5c piece will work a bit less well, because there is precious little metal in coins these days. The coins must be sanded clean, wires soldered to one side of each, and the other sides of the coins pressed together on either side of a piece of vinegar-moistened paper (or use spit if no vinegar available!). An ordinary commercial small 1.5V dry cell also works magnificently, and no power switch is needed because of the tiny drain (= shelf life).

Incidentally, reference to my Electrochemical Series tables suggests that even more potential can be obtained from a simple home-made cell using silver*and zinc electrodes, compared to the silver-copper ones described above. But this could require proper battery solutions, and I'm not sure it would give any advantage for this primitive cell; why not try it and let us know?

*silver = + electrode

The amplifier of fig. 2 works better than any of the nominal common emitter ones used with xtal sets, because of the lower distortion provided by the common-collector configuration. Bias is provided by the diodes, and produces no overload until the signal becomes intolerably loud (my son had to detune C2 to attain reasonable volume, even without the amplifier!). With good quality phones, fidelity is magnificent! (THANKS to RHF!)

The amplifier of fig. 2 has high input impedance because of this inherent feature of emitter followers (analogous to cathode followers), so allowing the diodes to be tapped further out on the coil (e.g. ±40%), giving higher output for the same selectivity.

(9) A self-powered arrangement is indeed possible, powering the amplifier of fig. 2 from a fig-1 type P/S, but this is ONLY of advantage when using a stronger station to power a weaker one. Furthermore it is NOT practical unless you use two separate well-spaced antennas. It is, believe me, much more practical (and more fun) to power the amplifier from a photocell; ambient light is usually enough -- and the set should be off anyhow when the lights are off...

10) Here is something strange: Fig. 3. No earth connection! Tap at 50-100% of coil, depending on signal strength vs selectivity. Compare signal strength (On meter) with strength after earth is connected to point "X". The explanation is fairly obvious if you think about it, but has some unusual consequences which I'll explore in Part II here one day.

I should like to thank Stephen Gunther (13) for the fine job of construction he did on the crystal set chassis and parts shown on the front cover of this issue. And he did all of the wiring himself, except for the diodes. The extra socket and transformer are for a valved loudspeaker amplifier, not yet wired in. Stephen plans to build his own battery for that effort.

>>>>>>>>><<<<<<<<<

Postscript

→ Hot carrier diodes in the crystal set do not work as well as good germanium point contact types (OA90, 1N69, etc), but better than poor ones (e.g. some from the computer boards). But the HCD are magnificent at 1000Mc! -- and for high Z load

Incidentally, in our setup, a good balance between strong and weak station response was obtained by shunting the meter to 200μA, and using 2.7K series resistor with the silicon diode.

Postpostscript:

In the May (not April) 1972 issue of QST is reprinted an announcement from March 1920 telling how an ordinary crystal set may be made to oscillate simply by applying bias to the crystal (and the way the diagram looks, it is back biased -- some kind of negative resistance zener

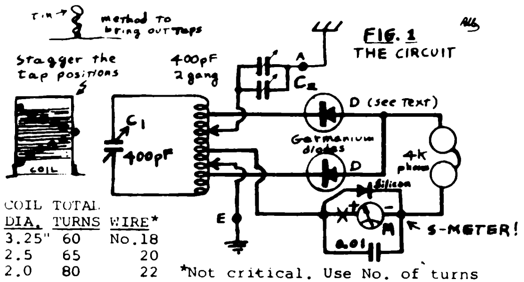

FIG. 1
THE CIRCUIT

COIL DIA.	TOTAL TURNS	WIRE*
3.25"	60	No.18
2.5	65	20
2.0	80	22

*Not critical. Use No. of turns to get lowest frequency signal when $C_1 <$ max cap.

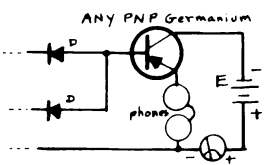

Fig. 2 : An emitter-follower Amplifier. $E \geq 0.3V$, 5-500μA

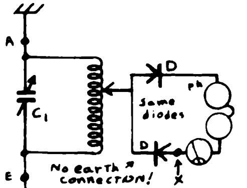

Fig. 3 : Rectabular Feedback Implifier

effect?). But I doubt that the trick would work with ordinary point-contact germanium diodes (e.g. OA91). The QST correspondent (K2NP) said that the crystal was likely a blend of chalcopyrites and zincite; where would one find that??

Incidentally, point-contact diodes are widely available as suitable for the ordinary crystal set. If the diodes are used from computer boards you'll want to test a few to see which gives the best results on the Crystal Set's S-meter. Otherwise obtain an OA90 or OA91 from any suitable distributor (Kitsets has them for 17c, and local prices would be comparable though somewhat higher).

CHEAP ZENER DIODES?

While I'm talking about diodes, I might mention an article in the June 1972 issue of the WIA/VK5 Journal, by Rick Matthews, VK5ZFQ. He found several transistors having reasonably good zener properties when used between base and emitter, e.g. the 2N3638 ($dE/dI = 2\Omega$) and 2N3642 (6Ω). In the early days this used to be considered quite a good lurk, but after making a number of tests on a variety of transistors I gave it away because of the relatively high dynamic resistance of many types and the indifferent voltage at which they would regulate. In the present instance, the 2N3638 does sound very interesting because it has about half the dynamic resistance of an equivalent 400mW zener in the 6-7V range, but the 2N3642 is no better than a 400mW and the other types Rick mentions are worse.

The price of zener diodes (according to Catalogues by Philips, Kitsets, etc) has come down to the point where it is about as cheap to buy a zener as a transistor, and the results are far more reliable in terms of voltage rating and dynamic resistance.

For my own part, if I want a dynamic resistance of only 2Ω I'll use a one-watt zener (BZY96, 1N3785, etc.) -- unless, of course, I happen to have a 2N-3638A (high gain version) lying about (which I usually do because it is a good general purpose medium power item, from Fairchild), and no 1W zener at hand. Simple commonsense.

XXXXXXXXXXXXXXXXXXXXXXXXXX

Johnson came home unexpectedly from a business trip to find his wife in the arms of his best friend. He staggered back and said, "Max, I'm married to the lady so I have to. But why you?"

-- Isaac Asimov

XXXXXXXXXXXXXXXXXXXXXXX

LETTER: SCR's in series, etc.

Here is a short item which may be of interest. When SCR's are used in a half-wave phase control for a capacitative load (or shunt wound motor etc, which generates considerable back EMB) the device must have a PIV which is twice the peak voltage of the supply. Thus, for use on 240V this implies an SCR with a working PIV of 800V, although the Forward Blocking voltage need only be 400V. This is shown in fig. 1 below ((and such SCRs with lopsided voltage ratings can be discovered by testing commercial units -- Ed.))

Essentially this may be accomplished, and a much cheaper 400V SCR may be used simply by including a 400V ((or more)) diode in series, with suitable equalising resistors across both circuit elements, as shown in fig. 2.

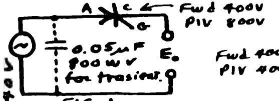

FIG. 1

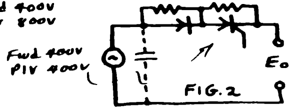

FIG. 2

-- --I. Binnie, VK2ZIU, Eastwood, N.S.W.
(Vice Pres. VHF and TV Group))

P.S. You could at least pretend to be ashamed when EEB is late.

-- I.B.

((We discussed this matter in early EEBs, but it doesn't hurt to have OM Binnie repeat it here. The value of the equalising resistors is not critical, but should be proportional to the PIV's of diode and SCRs they parallel. As a rough guide, one might calculate a value of resistance to give a reverse leakage current of 0.5 to 1.0mA at max PIV. -- Ed.))

((P.S. Yup, I'd be ashamed, but I'm too busy preparing the next issue... -- L.))

XXXXXXXXXXXXXXXXXXXXXXXXXXX

WHAT NOT TO DO ?

And then there was the chap who needed to vary the voltage from a battery of dry cells, and hit on the brilliant idea of fitting a series of switches to short out individual cells as required!

THE AUSTRALIAN EEB

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STATE OF THE RECEIVING ART -- VI (RLG)

(Final chapter -- for a while)

-- Some Elegant Method of Audio Processing

Last month I concluded our examination of Receivers, and Direct Conversion ones in particular, by ending logically at the a.f. stages. Matters of selectivity were discussed because in a D-C receiver the selectivity is primarily (but not exclusively) at a.f., but the same kind of subjects could of course, apply as well to superheterodyne i.f.'s: signal/noise, dynamic range, and the desirability of a square-top response.

Incidentally, a recent article in Ham Radio (3/72) points out that pot core inductors can be used to good advantage in cascaded parallel-tuned filters, and although that article dealt with FM application, the same principle could be used for other modes; pot cores can be obtained from Philips, STC, etc (or from WIA).

I do recall reading somewhere that a very squaretop selectivity response (fig. 10, dotted lines, last month) is not actually the best desirable, because of ringing or something. But no magazines have arrived here for several days, and I'm looking at no more of them, hurrying to finish this, or I'll never get it done! In any event, excess selectivity is rarely a problem in practical designs.

Interestingly enough, one of my students in the WIA beginners class asked my opinion about a transistorised receiver in the 1968 ARRL Handbook the other day. It was presented as a regenerative receiver, using a separate oscillator for the various benefits this obtained compared to including the regeneration in the detector stage. I thought that it looked familiar, and then I realised with a shock that it was in fact a Direct-Conversion receiver with primitive selectivity filtering; with a good a.f.-filter it could probably do a pretty good job.

Curious, isn't it, that the old old regenerative-detector receiver is really a Direct-Conversion receiver in disguise! Just advance the regeneration-control until it oscillates, and receive SSB.

We come now to the final portion of this particular effort, in which we discuss some particularly versatile and very useful product detectors. Unless you are receiving AM only (with an envelope-type detector), a product detector is essential in a modern receiver for SSB or CW -- whether it be at the front end (as in a D-C design), or at the end of i.f. stages (as in a superheterodyne).

TWO-PHASE DETECTION SYSTEMS:-

(Selectable sideband reception -- and the problem(s) of Audio Image.)

The "Two-Phase" system or "Signal Slicer" (31; see December 1971 issue) was introduced to EEB readers on p. 100 of the Sept 1969 issue, but at that time I had no idea it was relevant to the idea of Direct Conversion -- nor (let me be honest) did I have much of an idea how it worked!

The two-phase detector is able to select one of two sidebands and reject the other. If SSB (or CW) is received, interferring signals and noise are rejected from the other side of the carrier. If DSB (or AM) is received, the sideband can be chosen having the least interference. The system can be (and has been) applied to a superhet just as easily as to Direct Conversion ("D-C").

Sideband selection can also be done in a superhet by switching BFO either side of the i.f. This gives performance analogous to the phasing method for comparable circuit design, but cannot be applied to a DC system, because its i.f. is zero (See ch. 4, Ref 29a) (Thanks to Dick for straightening me out on this)

In a Direct Converter, an interfering signal can come in nicely on the other side of the desired one, because the r.f. bandwidth is twice the audio filter bandwidth; see fig. 10 (p. 28, last month)

It can be seen that the interfering signal will be received as happily as the desired one, and constitutes an "audio image". Under conditions of QRM it is a severe nuisance in DC. It (and the QRM) can be eliminated (at least by some -40db) by a Two-phase Detection system, which essentially chops off everything (in this example) below f_o. This can also be useful if used at the end of an i.f., but might not be necessary if the i.f. selectivity filters are really sharp.

With the signals below f_o, noise is also eliminated, thus increasing the noise factor by 3db for an SSB signal (8d), and that is pleasant, no?

The Audio Image

It should be noted that the concept of the audio image as shown in fig. 10 is not particularly new. It has been mentioned for some time in the ARRL Handbook, but only in reference to selectivity requirements for the i.f. amplifier of a superhet. Radio frequency images have been attacked classically by the tuned circuits in the front end, abetted by the R.F. Amplifier.

In the DC system, however, I.F. Freq is zero, so all selectivity must be provided either at r.f. or at a.f. This places an impossible requirement on the r.f. tuned circuits (which still work to avoid images and adjacent X-mod) and leaves the job entirely to the a.f. filters. The latter accepts signals impartially from either side of the carrier frequency, and although steeper-skirt selectivity can reduce these audio images (effect of dotted lines in fig. 10) it cannot "eliminate" them. It is possible to obtain substantial discrimination against audio images by threshold gating techniques (17d), but although this has considerable advantage for CW reception, it is useless for phone because of intolerable distortion.

For radiotelephone (and most CW) reception it is necessary to phase out the offending side of the bandpass, as in the "two-phase detector". A typical one is:

The Simple "Signal Slicer"

This is quite analogous to the "phasing" process in an SSB transmitter where one sideband is selected by phasing out the other, but here it is turned about (24b-1, 19a, 26g, 30, 31). See the over-simplified diagram, fig. 11.

The received signal (A) and the local oscillator (B) are fed 90° out of phase (C) to two mixers -- as in fig. 3a, but the d.c. error signal (D) is not (here) used to phase-lock the oscillator. The demodulated sidebands (also at D) are thus 90° out of phase (or in "phase quadrature"). They are then fed to an audio phase shift network (AFPS) which advances them another 90°, with the net result that sidebands are either in phase or out of phase with each other. These are then summed up or cancelled out in a differential amplifier. The sum gives one sideband with the other cancelled, and the difference gives the converse.

The actual phase relationships can be seen clearly from the vector diagrams of Ref 16d or 30.

The circuit of fig. 11 is essentially that of the GE "Signal Slicer" (31c, 31d) and achieves impressive results with a modest amount of circuitry. This useful circuit has been brought into contemporary literature through Ref 19a, 30, and 31b, but for the unfortunate fact that the modern ARRL references to it omit to supply the details of the audio phase shift network (AFPS in fig. 11 here), either in the receiving or transmitting chapters of their Sideband or yearly Handbooks. Good solid amateur technology well summarised on p. 101 of the 1958 edition of Ref. 30: "This network isn't shown in the schematic, but J2 is the octal tube socket it plugs into. For anyone who has fears about the complexity of an audio phase-shift network, forget them; the --- is inexpensive, comes sealed in a metal tube envelope, and all you do is plug it into the socket". Presto.

More imaginative readers will, however, find the details of this dreadfully complicated device using four resistors and four condensers, in receiving or transmitting chapters of Refs 29a, 29b, or 31 (also in older editions of Ref 30!).

Adding Phase-Locking

With only modest increase in complexity the versatility of the fig. 11 type of circuit can be enhanced.

If the d.c. component of one of the mixers (at D) is made to control the oscillator (BFO) as in fig. 3a, the same result will be obtained for AM, FM, FSK, etc, but with the stability and inherent selectivity of phase-synchrony. Circuits for this appeared in the 1958 (but not later!) edition of Ref 30, and in 31d. Additionally, AM can be detected considerably more efficiently than with a conventional envelope detector (5, 6, 15, 33). It can be detected in a non phase-locked product detector, as I mentioned earlier, but only with considerable dificulty (15, 19b, 31c).

If, on the other hand, a balanced audio phase detector fed from the mixers (at D) controls the BFO frequency, a Double Sideband Suppressed Carrier signal

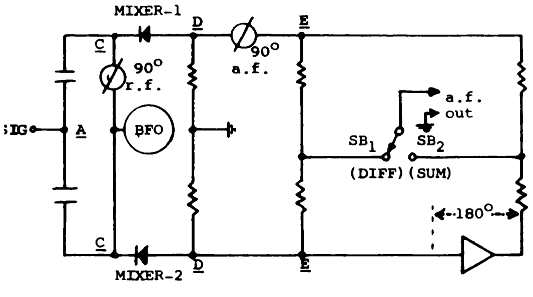

FIG. 11: OVERSIMPLIFIED TWO-PHASE DETECTOR
The r.f. signal is divided in two. Half is mixed with the Local Oscillator ("BFO") directly, and half with same shifted 90°. Further phase shifting after detection allows summation or difference signals to be selected. This cancels the undesired side, e.g. everything below f_o in fig. 10 (last month), with obvious advantage in rejecting QRM (and noise!).

(or AM, FM, etc) can be received*. Depending on the output phase and summation circuits we can then receive

a) Both sidebands (for a 6 db improvement over SSB!), or
b) Either sideband (with elimination of QRM or noise on the other side, and a 3db improvement of S/N for SSB).

These various systems will probably be considered in more detail eventually in these pages...

AGC

In all phase-lock systems, conventional AGC is not possible, because the detector produces no d.c. component proportional to signal until synchrony is achieved. But audio-derived AGC is quite practical. It is treated often in 24b, and in all Handbooks. For current application to PLLs see 24b-1 and 34a.

The Third Method

The "Third Method" of sideband phase-suppression is well discussed by Refs 26g, 29ab, 30, 31, etc. It is a rather elaborate arrangement where the balanced modulators of fig. 11 (the mixers) feed another set of balanced modulators which mix signal from a fixed audio oscillator, etc etc. This method is said to have the advantage of using only fixed-frequency phasing networks, not requiring the compromises of broadband ones. But I have never seen it applied to receiving; only for producing transmitting SSB, for which it is claimed to produce better sideband suppression than two-phase systems. Anyone have any ideas on this?**

?

---

* This is some trick: Phase synchronising on a non-existent carrier. Its easy enough when the carrier is there (31,33), but removing the carrier forces you to obtain all phase information from the sidebands. This is not possible with SSB because only one sideband is available, and that won't tell you enough. It is for this reason that DSBSC reception has all of the operational advantages of AM without some of the awkward properties of SSB. More, much more on this another time! -- RAJR

**Yes yes I do! Its simple! -- RHF.

-- Well, then build one for us, as you have been threatening to do for several years! -- RLG.

New Wine in Old Skins?

Now, with few exceptions, the references mentioned above refer to circuits using the lowly valve -- and even include some pointed comments on the substantially better (lower noise) results to be expected from using diode valves than crystal diode semicons (though nowadays I should think that H.C. Diodes would surpass those by quite a lot).

I had been brainwashed by Handbooks etc, into believing that synchronous detection was infeasible becuase of its "obvious complexity" (29a* , 28). Yet I was amazed to find that a simple signal slicer of fig. 11 type used only 4 valves (31c, EEB Sept 1969).

With full carrier phase locking it needs 5 valves (only 4 if we use a varicap to control the VCO)(Ref 30: 1958 edition, not later). A deluxe version used 8 valves (31d).

Finally, deluxe audio-derived phase locking can be obtained from 8 valves. That is "obvious complexity" when a garden variety SSB exciter uses a comparable number of valves, a decent receiver uses a dozen of them or two score transistors (29a)? -- though come to think of it, who builds his own exciter or receiver nowadays?

It can't simply be the matter of valves vs transistors. For example, ARRL -- who can hardly be accused of having an anti-semiconductor bias -- are still using valves when superior performance is required (21b-3), as are RSGB (24a).**

---

* Describing rather concisely the block diagram (only) on p. 4.43, RSGB say: "The obvious complexity of this (phase synchronous) arrangement shows fairly clearly why it is simpler to generate a SSB signal in the first place than to attempt reception of both sidebands of a DSB signal". But this Argument From Simplicity flies in the teeth of the fact that as soon as Exciters started to become complicated owing to SSB, Hamdom made a mass exodus out of the workshop and into the commercial equipment showrooms. Admitted, we usually bought (and then thoroughly modified) our receivers, but at least most of us made our transmitters -- and ENJOYED it.!

** In 21b-3, Blakeslee applies to valves the previously lighthearted suggestion that only an Immense Valve would be the way to achieve good linearity; see our discussion of this as applied to FETs, EEB, Nov 71, p. 105. The results he achieves in immunity to strong adjacent signals can only be described as "spectacular", overworked as that word may be. SEE: Rad. Comm. 7/72, p. 453!

NO. I think that Synchronous and phased detector systems simply needed the rapid push of Progress to become popular (35), and the needed push was the resurrection in the 1968 QST of the idea of putting a product detector at the Front End.

Now, if the job can be done well with 5 valves at the end of an i.f., the introduction of an IC at the front end of the receiver has not necessarily been the reason for its popularity on the basis of simplicity alone -- ignorning the fact that an IC will generally use far more transistors-worth of circuit than would be seen in a discrete circuit. (See examples, 5, 16, 34a-2).

The IC simply triggered the widespread interest in the subject for an idea "whose time was ripe". Let us, then, not forget that there are some taske which valves can perform more concisely and more efficiently, merely for the sake of a bit of HT and some beautifully glowing filaments. The argument has been very cogently stated by G3VA in Ref 24b-7 to which I recommend you.

A New Skin ?

My attention has just been directed to a new kind of Detector, the "Reciprocating Detector" described in the March 1972 issue of Ham Radio (17c). It appears to be a kind of triggered regenerated carrier system which achieves all of the advantages of phase-synchrony without a phase locked loop controlled oscillator. The oscillation level is self-adjusting, and the device is said to perform admirably on DSB, SSB, Phone, CW, etc. Hooley Dooley!

In considering the immense ease with which DSBSC signals can be produced (and a number of cogent arguments for its manifest superiority in several directions), could this be the beginning of a new era, where DSB becomes popular? And where transmitter-building becomes a recovered art?

A predominant feature of this inherently synchronous self-adjusting detector is the apparent simplicity of the circuitry -- requiring only a few transistors (and likely even fewer valves or FETs). No need for the vast elaborations of a conventional PLL system, nor therefore for the ICs needed to package it. Yet, as I have pointed out above, even PLL systems need not be unduly complex in terms of today's technology. In such matters it is important to keep from being blinded by Science.

Rod has looked over Badessa's Reciprocating Detector, and snorted that he had that idea long ago, but with.... etc. The difference is that he didn't publish it! Hi. Dick says that he has some reservations on Badessa's system, and that his PLL design ought to do better; but I'm still waiting for him to build it. Torque is cheap, as the saying goes.

Postscript

Since the above was written we have received Badessa's nice article on the Reciprocating Detector, the first part of which appears in this EEB. It looks quite fascinating. What do you think?

REFERENCES

A thorough summary of references and the way in which they are organised, was presented in the December 1971 EEB, to which the reader is referred. The July 72 issue of 73 reprints VK4ZFD's interesting Ref 8b.

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

LETTER: FM and Phase Modulation

As FM and Phase (Angle) Modulation is the "In Thing" at the present, I for one will look forward to seeing something of the technique, presented in the RLG manner in future issues of EEB.

-- V. Kerr, VK4LK, Charters Towers, Qld.

((There has been quite a lot on this in Amateur Radio recently; why should we duplicate it? And every amateur in Australia should belong to the Wireless Institute, thereby to receive AR

On the other hand, this does remind me of some very interesting discussions I have had with Dick Ferris on this subject, and perhaps he will wish to give us a nice simple explanation of the real difference between AM and FM, on the basis of vector concepts??????? Its not as obvious as the Handbooks imply. We are told that AM sidebands (including SSB of course) are composed of sum-and-difference frequencies disposed about the carrier, but for FM too, "the modulation process leads to the generation of a new set of radio frequencies symmetrically disposed about the original carrier frequency". What is the difference? It is a fairly subtle matter. Wot say Dick?))

CORRESPONDENCE TO THE EDITOR

((Grid Leak, QSP ARNS Bulletin, 10/71))

Dear Mr. Ed:

I read with interest your advice to Mr. N.W. and so I did much the same. I traded my wife of 40 for 2 - 20's, only to find that I am not wired for 2 - 20's. Therefore, I got burned. Is this your fault or mine? -- WW.

Dear WW:

I happen to be acqainted with your 2 - 20's. Consider yourself lucky that the only thing you got was burned.

((etc in same vein, then:))

Dear Ed:

How can I get extra copies of your club paper? -- Bird Lover.

Dear BL:

Back issues are available for five dollars each. Send the money in cash.

REVIEW: The ARRL Handbook, 1972 -- RLG

Every four or five years I feel it worthwhile to obtain a new ARRL Radio Amateur Handbook, as a compendium of simple state-of-art technology. I don't get their Handbook more often, because that $7.50 per year (in Australia) is better spent on a magazine subscription or two, which keeps me up to date on the latest experimenter and amateur technology. Furthermore, I read the magazines; it is not easy to sit down once a year and read the Handbook through.

In fact I have now obtained a 1972 ARRL. Kallam's comments last month seem to be valid, but at the same time I would note that since my 1968 edition there has been a massive infusion of semiconductor technology, and since 1971 an increase in the number of ubiquitous square and triangular boxes representing packaged ckts.

It is evident that it would be altogether impossible adequately to put in one book all technologies covering fundamental, developmental, and applied subjects (but what about Rod's suggestion for a double volume with the Purposes he described?).

We may carp at poor old Blakeslee for omitting a Vackar, or neutralising his MOSFET, or giving away the whole subject of DSB communication (which is capable of substantial benefit) by the statement that DSB reception can be achieved without difficulty if your receiver chops off one of the sidebands!

The fact remains that his overall effort is, in my opinion, commendable; Rod and Dick are free to express their opinions as engineers, but I should think that my point of view would be closer to that of the harried experimenter and amateur. As Kallam says, the book tends to be shallow, but on an elementary level it is nothing if not comprehensive: a wide range of instruments and circuits is covered.

If a more thorough coverage is required there exists a wealth of books dedicated to that purpose, from the Orr and RSGB Handbooks, upwards. To do the job properly you would need several volumes of the calibre of Langford-Smith ("Radiotron Designers' Handbook").

Additionally, I am well in agreement with the increasing ARRL tendency to refer subjects to recent articles in QST (though other literature also exists), since this allows effective coverage of considerably more material than can be accomodated in the limited pages of the Handbook.

One hopes that Rod's plaintive call for another Langford-Smith will be realised (EEB, Feb 72 p. 20ff). In the meantime we have at least three main radio handbooks, and between them one ought to be able to discover enough good oil to satisfy the fastidious.

Now then, I showed to my class of young chaps in the YRCS, the three named Handbooks, and asked which they would prefer to use initially. The nearly unanimous opinion was the choice of the ARRL, with interest in RSGB and Orr when they knew rather more about electronics. The ARRL work obviously appeals more to the beginner, and it seems to be the answer to Kallam's query whether or not this was a "good thing". Fair enough, We'll get them the ARRL Handbook, and I'll fill in for them more detailed aspects from the other books, eventually encouraging the boys to obtain the other books as well.

I do not, however, want to obtain 1972 editions of the ARRL Handbook for these students. There are too many black boxes. It will do little for them to see a mixer represented by a rectangle with 8 connections, even though the discrete circuit has (still) been presented in a previous section. They'll have ample opportunity to embrace that kind of electronics later.

Could you, therefore, please help us? I want to obtain at least 6 copies of the ARRL Handbook in any edition from 1967 to 1971, in no particular order. Will you sell us your old copy? In return I am willing to order from America for you, the 1972 edition, at a cost of about $A4.50 postpaid -- a substantial reduction over the Australian price.

What say?

XXXXXXXXXXXXXXXXXXXXXXXXXXX

Dandelion Wine

Put 6 cups dendelion petals, 2 lbs of sugar, 1 lb cut up raisins, 3 tsp acid blend, 1 campden tablet, 1/2 tsp yeast nutrient, 1/4 tsp grape tannin in a gallon crock or plastic container. Pour a gallon of hot water over the ingredients, cover with plastic sheet and add packet of wine yeast when liquid cools to 70°F. After three days, strain petals and raisins out, syphon wine into jug and attach fermentation lock to jog. Wait three weeks, syphon everything but yeast into new jug. Let stand three to six weeks (until liquid is clear) Put in bottles, let age six more months (or more). Why fight lawn dandelions? Use them!

SWOOP -- Elise White (YF/K0CNV)

((From: Bulletin of the Amateur Radio News Service, Feb. 1972))

I'm sick and tired of computerised, transistorised, miniaturised gadgets that develop squeaks, squalls, groans, and weird wails when something else is turned on.

It all began when I got an AM-FM radio that develops noises that sound like a Devil's Convention when the toaster, coffee pot, Joe's ham gear or electric blanket is turned on.

The coffeepot developed a stomach ache and moaned and squalled all the time it was perking like it was in agony. If I turn on the new electric blanket, the dog starts to howl and the cats swell up like disaster is about to strike. The telephone (one of those push button jobs) gargles, groans, and dings if you use the Dial-O-Matic sewing machine.

Joe has been called out 5 nights to inspect the transistorised gizzards of trucks because if the horn honks, the marker lights play "Bach's Fugue."

If you plug in the tape deck, the fuel system ceases and assorted other goodies too numerous to mention. This isn't the only problem. The new VW's won't run if you plug in your ham gear!!

The bank misplaces a bank deposit and it takes the computer three weeks to find the mistake. ((shux, we at EEB don't need a Computer to accomplish that*))

You pay a bill and the computer bills you for three months, telling that the account is overdue. The balance is $00.00. The overcharge is $00.00, and if you don't immediately pay the bill something drastic will happen.

Hams buy these mini-sets that it takes a magnifying glass to inspect its innards and they develop epazootic dumfugit and have to be repaired. Their little insides are so scrambled that someone makes a wild guess, pokes something in and prays like fury that they got the right part in the right place and when tested doesn't light up like a pin ball machine.

The color TV has had purple people for so long that I'm sure we've been invaded from outer space when I see normal people wandering around.

I'm just about ready to go back to a coal stove, kerosene lamps and an old crystal set. At least all they do is blow up, go out or not work, but a least they are predictable and that's more than you can say about the stuff today.

((Ah, Fair Elise, Australian colour TV isn't purple, its perfect -- or will be when we get it. -- Staff))

ANSWER TO PUZZLE

The series motor is not a constant speed device. So it delivers maximum power in this instance, at 5000 RPM when turning the load at 1000 RPM. The motor current is inversely proportional to RPM, and power is proportional to I^2, so P varies as $1/(RPM)^2$. Now, the motor cannot produce more power at 2000 RPM than it does at 5000. Therefore it will not turn the load at 1000 RPM at 2:1 ratio. In fact at 2000 RPM , 6.25 times as much power is required to turn the load as at 1000.

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* You'd never believe it, but between the last line and this one this magnificent typing machine developed Epazootic dumfunus, just as Elise sez, and this being a very long "weekend" in VK there was no hope but to take the panels off and peer into its complicated obscurities. A few hours later a Thingee was constructed which went into its scrambled insides, and now it drives like a Bentley. When the typewriter man comes next week, though he's going to turn purple himself. You cain't win, just like the girl says! --RLG